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CLALLAM BAY SEWAGE TREATMENT PLANT
SEKIU SEWAGE TREATMENT PLANT
JULY 28 and 29, 1987
CLASS II INSPECTION REPORTS

by
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ABSTRACT

Class II inspections were conducted at the Clallam Bay and Sekiu Sewage Treatment Plants on July 28 and 29, 1987. Both plants are small rotating biological contactor secondary facilities operated by Clallam County. The plants provided good BOD_5 and TSS removal during the inspection and were within most NPDES permit limits. Improved maintenance and laboratory/sampling procedures are recommended.

INTRODUCTION

Class II inspections were conducted at the Clallam Bay and Sekiu Sewage Treatment Plants (STPs) on July 28 and 29, 1987. Both plants are small rotating biological contactor (RBC) secondary facilities operated by Clallam County. Discharge is into the Strait of Juan de Fuca as limited by NPDES permits #WA-002443-1 for Clallam Bay and #WA-002444-9 for Sekiu. The inspection was conducted by Marc Heffner of the Ecology Water Quality Investigations Section (WQIS) with the help of the plant operators, John Sikes and Brian Richardson. The two operators are responsible for operation of both plants.

Clallam Bay and Sekiu attract numerous tourists during summer when salmon runs peak. The inspection was timed to coincide with this period of high STP loading. Objectives of the survey included:

1. Describing present plant operation.
2. Collecting samples to determine plant loading and performance.
3. Reviewing laboratory and sampling procedures to determine compliance with approved methods.

PLANT OPERATION

The flow schemes for the two plants were the same (Figure 1). Wastewater first passes through a bar screen and enters a grit channel. The influent is then combined with secondary sludge before entering the primary clarifier. The primary effluent is split and run through one of two RBCs. The RBCs are run in parallel with each unit baffled to provide two stages of treatment per shaft (CWC-HDR, 1986). Flow from the RBCs is sent to a secondary clarifier, then through an underground chlorine contact chamber. Flow is measured at an effluent 60 degree V-notch weir and discharged into the Strait of Juan de Fuca.

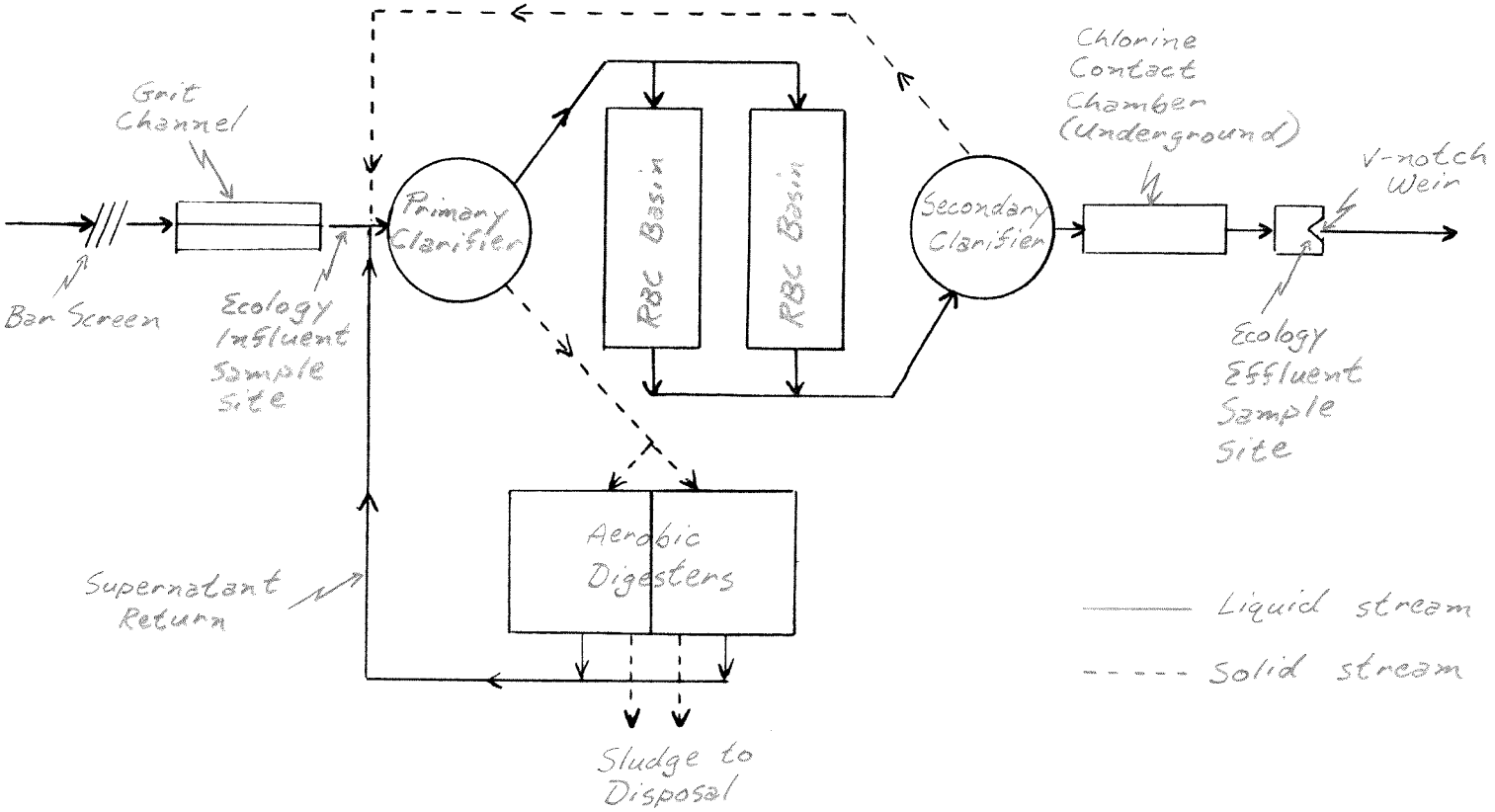

Figure 1. Flow scheme - Clallam Bay/Sekiu, July 1987.

Primary and Secondary sludge from the primary clarifier is aerobically digested then applied to trees, lawns, or the local high school football field depending on time of year.

PROCEDURES

Composite influent and effluent samples were collected by Ecology at both plants. Isco compositors collected approximately 200 mLs of sample every 30 minutes for 24 hours. Samples were split for analysis by the Ecology and STP laboratories. Sampling times and parameters analyzed are noted on Table 1.

The two STPs share one set of composite samplers. Composite samples are collected one day at Sekiu and the next day at Clallam Bay. Equal volumes are collected hourly for a 24-hour period. The Sekiu samples are refrigerated until Clallam Bay sample collection is complete, then both sets of samples are analyzed at the Clallam Bay laboratory. During the Class II inspection, only the Sekiu composites were collected. The effluent sample was analyzed by Ecology (Table 1). The influent compositor malfunctioned resulting in inadequate sample for analysis.

Grab samples were also collected during both inspections. Samples collected and parameters analyzed are noted in Table 1.

Flows at each plant are measured at an effluent 60 degree V-notch weir. The plant totalizer meter was operating at the Clallam Bay plant, but the Sekiu meter was not functioning during the inspection. Ecology instantaneous measurements were made at each plant.

RESULTS AND DISCUSSION

Flow measurements are summarized in Table 2. Since the Sekiu meter was broken, flow for calculating inspection loadings was estimated using the Ecology inspection instantaneous measurements. The flow meter needed replacement parts, which were on order.

The Clallam Bay flow totalizer was functioning, but the instantaneous recorder was not calibrated. The totalizer measurements looked reasonable in relation to the Ecology instantaneous measurements, but actual determination of meter accuracy was not possible without the plant meter instantaneous measurements (Table 2).

Flow measurement at the RBCs was difficult. This measurement should be made to balance loadings to the two RBC basins at each plant. Unbalanced loading was suspected, but flow measurement was unsuccessful. A measurement system, perhaps smaller outlet weirs with staff gages, is recommended.

Table 1 - Samples Collected and Parameters Analyzed - Clallam Bay/Sekiu, July 1987.

Station	Date	Time	Sampler*	Laboratory*	Field Analyses					Laboratory Analyses																
					Temp. (°C)	pH (S.U.)	Conductivity (Umhos/cm)	Chlorine Residual (mg/L) Free	Chlorine Residual (mg/L) Total	Fecal Coliform (#/100 mL)	BOD_5 (mg/L)	$CBOD_5$ (mg/L)	COD (mg/L)	Solids (mg/L) TS	Solids (mg/L) TNVS	Solids (mg/L) TSS	Solids (mg/L) TNVSS	Turbidity (NTU)	Nutrients (mg/L) NH_3-N	Nutrients (mg/L) NO_2-N+ NO_3-N	Nutrients (mg/L) Total-P	Conductivity (umhos/cm)	Alkalinity (mg/L) as $CaCO_3$)	Sludge Metals + % Solids
CLALLAM BAY																										
Influent	7/28	1130			X	X	X						X			X									
		1540			X	X	X						X												
	7/29	0930			X	X	X						X			X									
	7/28-29	1100-1100	Ecology	Ecology							X	X	X	X	X	X	X	X	X	X	X	X	X	X	
				Ecology							X		X	X	X	X	X	X	X	X	X	X	X	X	
				County							X					X									
Effluent	7/28	1100		Ecology	X	X	X	X	X				X			X									
				County					X																
		1550			X	X	X						X			X									
	7/29	0830								X															
		0915			X	X	X		X				X			X									
		1115								X															
	7/28-29	1100-1100	Ecology	Ecology							X	X	X	X	X	X	X	X	X	X	X	X	X	X	
				County							X					X									
Sludge	7/29	0940														X	X								X
SEKIU																										
Influent	7/28	1015			X	X	X						X			X									
		1620			X	X	X						X			X									
	7/29	0855			X	X	X						X			X									
	7/28-29	1100-1100	Ecology	Ecology							X	X	X	X	X	X	X	X	X	X	X	X	X	X	
				County							X					X									
	7/28-29	1200-1200	County		sampler plugged - inadequate sample for analysis																				
Effluent	7/28	0955			X	X	X	X	X				X			X									
		1610			X	X	X						X			X									
	7/29	0845			X	X	X			X			X			X									
		1155		Ecology					X	X															
				County						X															
	7/28-29	1100-1100	Ecology	Ecology							X	X	X	X	X	X	X	X	X	X	X	X	X	X	
				County							X					X									
	7/28-29	1200-1200	County	Ecology							X		X	X	X	X	X	X	X	X	X	X	X	X	
Sludge	7/29	0900														X	X								X

*Grab sample collection and analyses by Ecology unless otherwise noted.

Table 2. Flow data - Clallam Bay/Sekiu, July 1987.

Date	Time	Plant Meter Instantaneous	Plant Meter Totalizer	Flow for Increment (MGD)	Ecology Instantaneous Measurement (MGD)
CLALLAM BAY					
7/28	0800	*	1877916		
				0.074	
	1100		1878008		0.089
				0.074	
	1400		1878100		0.068
				0.059	
7/29	0820		1878547		0.046
				0.072	
	1115		1878634		0.017
		Average flow rate = 0.062 MGD			
SEKIU					
7/28	0955	---------meter broken----------			0.094
	1610		"		0.127
7/29	0845		"		0.219
	1155		"		0.083
		Average flow rate = 0.13 MGD**			

*No instantaneous read-out on plant meter
**Estimated from Ecology instantaneous flow measurements

Data collected during the inspection are summarized in Table 3. The data show good BOD_5 and TSS removal by both plants. Also partial nitrification was occurring at both facilities.

Table 4 compares the inspection data to NPDES permit limits. The Clallam Bay plant was within permit limits for all parameters except fecal coliforms. The high coliform counts were attributed to a chlorinator failure during the inspection. The problem was discovered on the first day of the inspection but was not fixed before the inspection ended.

The Sekiu plant appeared to be within all limits (Table 4). As previously stated, the loading calculations were based on Ecology instantaneous flow measurements. Thus, the loads calculated are questionable.

Table 5 compares inspection loadings with design loading criteria (Ecology, 1985). The Sekiu plant was more heavily loaded than the Clallam Bay plant, but the comparison indicates there was additional capacity at both plants. The detention times in the clarifiers were higher than recommended, but plant performance was good. Excess detention time may be a problem during low hydraulic loading periods at the plants.

Sludge metal data are summarized in Table 6. The Clallam Bay and Sekiu data are compared to data collected by WQIS during previous Class II inspections at trickling filter and RBC plants statewide. The zinc concentrations were low in comparison to the statewide data while the other metals concentrations fell within the expected ranges.

Laboratory Discussion

Sample collection and laboratory analytical reviews were conducted as part of the inspection. Problems were numerous, so Darrel Anderson at the Ecology Southwest Regional Office was notified shortly after the inspection (Appendix I; Heffner, 1987).

Results of the sample splits are summarized in Table 7. BOD_5 results comparison is acceptable except for the Clallam Bay effluent sample. TSS comparison is poor except for the Clallam Bay effluent. The reason for poor TSS comparison was not apparent during the laboratory procedure review.

RECOMMENDATIONS AND CONCLUSIONS

The Clallam Bay and Sekiu STPs were providing good BOD_5 and TSS removal during the inspection. The discharges were within most NPDES permit limits. Broken equipment--the chlorinator at Clallam Bay and the flow meter at Sekiu--prevented the discharges from being within all NPDES permit limits.

Table 3. Ecology Laboratory Analytical Results - Clallam Bay/Sekiu, July 1987.

Station	Date	Time	Sampler+	Field Analyses: Temperature (°C)	pH (S.U.)	Conductivity (umhos/cm)	Chlorine Residual (mg/L): Free	Chlorine Residual (mg/L): Total	Laboratory Analyses: Fecal Coliform (#/100 mL)	BOD_5 (mg/L)	$CBOD_5$ (mg/L)	COD (mg/L)	Solids (mg/L): TS	Solids (mg/L): TNVS	Solids (mg/L): TSS	Solids (mg/L): TNVSS	Turbidity (NTU)	Nutrients (mg/L): NH_3-N	Nutrients (mg/L): NO_2-N + NO_3-N	Nutrients (mg/L): Total-P	Conductivity (umhos/cm)	Alkalinity (mg/L as $CaCO_3$)
CLALLAM BAY																						
Influent	7/28	1130		17.2	8.2	700						450			210							
		1540		18.6	7.5	750						570										
	7/29	0930		17.0	7.2	440						420			63							
	7/28-29	Comp.*	Ecology							240	190	480	570	220	150	<1	54	27	0.71	12	623	210
										230		550	550	230	140	<1	50	27	0.70	11	623	210
Effluent	7/28	1100		17.5	7.4	540	<0.1	<0.1				60			6							
		1550		19.0	7.4	525						71			6							
	7/29	0830							84000													
		0915		17.4	7.4	490		<0.1				58			7							
		1115							66000													
	7/28-29	Comp.*	Ecology							11	6	48	310	200	6	<1	6	11	5.8	9.3	522	140
Sludge	7/29	0940													12000	1900						
SEKIU																						
Influent	7/28	1015		16.6	8.5	680						640			250							
		1620		18.0	8.3	750						640			170							
	7/29	0855		16.6	8.1	590						530			200							
	7/28-29	Comp.*	Ecology							230	160	510	580	220	230	9	45	34	1.3	10	689	240
Effluent	7/28	0955		17.3	6.9	550	<0.1	0.4				100			21							
		1610		18.5	7.0	550						110			40							
	7/29	0845		17.3	6.9	540			190			120			38							
		1155						0.5	11													
	7/28-29	Comp.*	Ecology							27	18	120	410	240	25	3	10	7	18	10	581	84
	7/28-29	Comp.*	County							26		130	410	240	23	<1	8	6.7	18	9.4	575	86
Sludge	7/29	0900													7000	1500						

+Grab sample collection by Ecology unless otherwise noted.
*Ecology composites were collected from 1100-1100 hours. The county composite was collected from 1200-1200 hours.
Duplicate Clallam Bay influent samples were submitted for analysis.

Table 4. Comparison of inspection results to NPDES permit limits - Clallam Bay/Sekiu, July 1987.

	C L A L L A M B A Y			S E K I U		
	NPDES Permit Limits		Inspection*	NPDES Permit Limits		Inspection*
Parameter	Monthly	Weekly	Results	Monthly	Weekly	Results
Flow (MGD)	0.12		0.062	0.15		0.13**
BOD_5 (mg/L)	30	45	11	30	45	27
(lbs/day)	20	30	6	38	56	29
(% removal)	85		95	85		88
TSS (mg/L)	30	45	6	30	45	25
(lbs/day)	26	39	3	38	56	27
(% removal)	85		96	85		89
Fecal Coliform (#/100 mL)	200	400	84000; 66000	200	400	190; 11
pH (S.U.)	$6.0 \leq pH \leq 9.0$		7.4; 7.4; 7.4	$6.0 \leq pH \leq 9.0$		6.9; 7.0; 6.9

*Ecology analysis of Ecology samples
**Estimated from Ecology instantaneous flow measurements

Table 5. Unit loadings - Clallam Bay/Sekiu, July 1987.

Unit	Size*	Parameter	Loading Comparison: Inspection Loading	State Design Criteria**
CLALLAM BAY				
		Flow (ave.)	62,000 gpd	
		Inf. BOD_5	240 mg/L (124 lbs/day)	
		BOD_5 to RBC+	87 lbs/day	
Primary Clarifier	Volume = 17,100 gal.	Detention time (hrs)	6.6	1.5 - 2.5
	Surface area = 254 ft^2	Surface overflow rate (gpd/ft^2)	240	800 - 1200
RBC	Surface area:	BOD_5 loading (lb/1000 ft^2-D)		
	1st stage = 50,300 ft^2	1st stage	1.7	5.0
	Total = 75,500 ft^2	Total	1.2	2.0
Secondary Clarifier	Same as primary	Surface overflow rate (gpd/ft^2)	240	700
Chl. Contact Chamber	Volume = 6650 gal	Detention time (hrs)	2.6	1
SEKIU				
		Flow (ave.)	130,000 gpd	
		Inf. BOD_5	230 mg/L (250 lbs/day)	
		BOD_5 to RBC+	175 lbs/day	
Primary Clarifier	Volume = 25,650 gal.	Detention time (hrs)	4.7	1.5 - 2.5
	Surface area = 380 ft^2	Surface overflow rate (gpd/ft^2)	342	800 - 1200
RBC	Surface area:	BOD_5 loading (lb/1000 ft^2-D)		
	1st stage = 54,400 ft^2	1st stage	3.2	5.0
	Total = 168,200 ft^2	Total	1.0	2.0
Secondary Clarifier	Same as primary	Surface overflow rate (gpd/ft^2)	342	700
Chl. Contact Chamber	Volume = 9160 gal	Detention time (hrs)	1.7	1

*From plant O&M manual (CWC-HDR, 1986)
**From (Ecology, 1985)
+Assume 30 percent removal in primary clarifier

Table 6. Sludge metals results - Clallam Bay/Sekiu, July 1987.

	Sludge (mg/kg d.w.)		Statewide Data*		
	Clallam Bay+	Sekiu++	Range (mg/kg d.w.)	Geometric Mean (mg/kg d.w.)	Number of Samples
Cadmium	4.5	4.5	0.01 - 16	5.6	16
Chromium	21	31	0.4 - 313	40	16
Copper	577	1150	28 - 3100	500	16
Lead	104	130	100 - 1140	300	16
Nickel	41	41	12 - 46	28	14
Zinc	133	198	680 - 2500	1600	16

*Summary of data collected for digested trickling filter or RBC sludge during previous Class II inspections in the state

+Clallam Bay sludge - 1.28 percent solids
++Sekiu sludge - 1.25 percent solids

Table 7. Split sample results comparison - Clallam Bay/Sekiu, July 1987.

Sample	Sampler	Laboratory	BOD_5 (mg/L)	TSS (mg/L)	Fecal Coliform (#/100 mL)	Total Chlorine Residual (mg/L)
CLALLAM BAY						
Influent	Ecology	Ecology	240	150		
		County	294	46		
Effluent	Ecology	Ecology	11	6		
		County	26	4		
Effluent	Ecology	Ecology				<0.1
	County	County				<0.1
SEKIU						
Influent	Ecology	Ecology	230	230		
		County	294	73		
Effluent	Ecology	Ecology	27	25		
		County	35	4		
	Ecology	Ecology			11	
	County	County			0	

A brief review of plant loadings indicated sufficient capacity exists at both plants. Flow measurements to assure the two RBC basins at each plant are loaded equally are recommended. Smaller RBC basin outlet weirs with a staff gauge may be adequate.

Routine preventative maintenance is needed, as evidenced by the chlorinator and flow meter problems. Also, improved sampling and laboratory techniques are necessary. Increased effort/training in these areas is recommended.

REFERENCES

CWC-HDR, Inc., 1986. Operation and Maintenance Manual, Clallam Bay and Sekiu Wastewater Treatment Plants, Clallam County, Washington, August, 1986.

Ecology, 1985. Criteria for Sewage Works Design, DOE 78-5, Revised October 1985.

Heffner, M., 1987. "Clallam Bay and Sekiu STP Sampling and Laboratory Procedures," Memo to Darrel Anderson, Ecology SWRO, August 12, 1987.

APPENDIX

ANDREA BEATTY RINIKER
Director

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504-6811 • (206) 753-2353

TO: Darrel Anderson

FROM: Marc Heffner

SUBJECT: Clallam Bay and Sekiu STP Sampling and Laboratory Procedures

DATE: August 12, 1987

Sampling and laboratory procedures were reviewed with John Sikes and Brian Richardson, operators of the Clallam Bay and Sekiu STPs, as part of the Class II inspection conducted on July 28 and 29, 1987. Procedural problems discovered suggest DMRs may not have been accurate. This memo documents the problems so they can be corrected. Problems noted included:

Sample collection

1. The influent sampler was located in the grit channel. According to the operators, this site was suggested by Ecology to ensure adequate influent solids concentrations which would further demonstrate good solids removal through the plant. This location likely explains the influent high solids concentrations, sometimes over 1000 mg/L, reported in the DMRs. The operators agreed to sample at the primary clarifier inlet site in the future.

2. The effluent sampler collects a chlorinated sample. Seeding was not done for the BOD_5 test as is required for chlorinated samples (APHA, 1985, p.529, 5.e.2)). Moving the effluent sampling site to the outlet box of the secondary clarifier, upstream of chlorination, was agreed on. The operators will sample at this site in the future. The need for seeding will be eliminated.

$\underline{BOD_5}$

Numerous problems existed with the BOD_5 technique. Purchase and use of premixed chemicals was suggested. This may allow more time to concentrate on proper test procedures and eliminate most of the error inherent in infrequent chemical preparation required at small STPs. Specific problem areas included:

1. Chlorinated effluent samples were not seeded. Collection of an unchlorinated effluent sample is planned.

2. A dilution water blank is run infrequently, and D.O. depletion in the blank is often high when checked (>1.0 mg/L). A dilution water blank should be set up along with each group of samples being tested. A D.O. depletion in the blank of >0.2 mg/L requires that the quality of the dilution water be improved so depletion does not exceed 0.2 mg/L (APHA, 1985, p. 527, 5.b.).

3. D.O. concentrations are measured using the Winkler method. The sodium thiosulfate being used was not standardized. Purchase of pre-standardized solution is suggested.

   Starch solution was not being used because the last batch mixed did not turn out properly. Failure to use starch makes test interpretation difficult, reducing the accuracy of the test. Purchase of pre-mixed solution is suggested.

   The sodium thiosulfate was being titrated using a pipette. Purchase of a functional burette is suggested.

4. The initial D.O. of the samples often fell in the 6 to 7 mg/L range. The initial D.O.s should be 8 to 9 mg/L. This problem may be related to the titration problems discussed in item 3. If corrections in item 3 do not correct the problem, additional investigation to find and correct the source will be necessary.

   The distilled water should be stored in the dark prior to being used to make dilution water. Aeration of the distilled water may be necessary if low initial D.O. concentrations continue to be a problem.

5. When adding dilution water to the BOD_5 test bottle, the bottles should be filled from the bottom to avoid entraining air. Entraining air during the filling process will give misleading test results.

TSS

The operators appeared to be running the TSS test accurately. A quarterly check consisting of redrying and reweighing the filter after the test is complete to assure complete drying is suggested.

Fecal Coliforms

The operators appeared to be running the fecal coliform test fairly accurately. Comments include:

1. Check to make sure that the incubator is set at $44.5 \pm 0.2^{\circ}C$. The incubator may have been set for $44.0^{\circ}C$.
2. Add sodium thiosulfate to the sample collection bottle prior to sterilizing it, rather than when the sample is brought into the lab. This assures that the sodium thiosulfate is sterile and the chlorine residual will be neutralized immediately upon sample collection.

It is hoped that the scheduled visit by the roving operator will be postponed until after new reagents are purchased by the plant operators. The operators' supervisors should be encouraged to allow the operators adequate time to upgrade laboratory techniques and to accurately run tests so DMRs will be accurate.

MH:cp